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ORIGINAL ARTICLES.

SOME REMARKS ON THE INFLUENCE OF ENVIRONMENT ON THE EYE.*

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MR. DARWIN, in his "Variations of Plants and Animals Under Domestication," quotes Dr. Lucas' remark that "there is not one single faculty of the eye which is not subject to anomalies." This statement Mr. Darwin proceeds to verify by quoting a list of cases of various anomalies transmitted, organic and functional—such as, for instance, in the first class, cleft iris, albinism, muscle anomalies, etc., and in the second class, color-blindness, night-blindness, day-blindness, etc.

What we need to remember is that inherited and transmitted anomalies are but accumulated acquired traits. These traits, usually so slight as not to be noticeable, become emphasized and magnified by transmission. Natural selection and adaptability to environment often work together.

This is beautifully seen in the rudimentation of the eye. The rudimentation of the eyes of the mole, for instance, is due partly to non-use of the eyes, and partly to the inflammation of the eyelids or nictitating membranes from the presence of dirt. And, "as eyes are certainly not necessary

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to animals of subterranean habits, a reduction in their size, with adhesion of the eyelids and a growth of fur over them might in such cases be an advantage, and natural selection would aid the effects of disuse." So, too, with the eyes of the cave dwellers. "In some of the crabs the foot-stalk remains though the eye is gone"—clearly a rudimentation from disuse.

In the case of the cave rat, the neotoma, specimens have been captured a half mile from the daylight that have had eyes lustrous and large, but blind. It has always seemed to me that the opponents to the belief in *asthenopia ex anopsia* had not made the acquaintance of the neotoma. The evidence of these graduations of the effects of environment on rudimentation is remarked by Schiodte. "We accordingly look upon the subterranean fauna as small ramifications which have penetrated into the earth from the geographically limited faunas of the adjacent tracts, which, as they extend themselves into darkness, have been accommodated to surrounding circumstances. Animals not far remote from ordinary forms prepare the transition from light to darkness; next follow those that are constructed for twilight, and last of all those destined for total darkness, and whose form is quite peculiar."

Thus, from Schiodte's point of view, by the time an animal had reached, after numberless generations, the deepest recesses, disuse will have more or less perfectly obliterated its eyes. This view is held by Lyell, by Agassiz, who was the first to describe the *amblyopsis*, and in fact by all naturalists so far as I know.

If these acquired traits may be transmitted, would it not be well to impress upon our minds the importance of the effect of daily environment upon the eye, such effects as come from occupation, climate, habits, etc.? The eye in its embryological development is formed by a juxtaposition of two saucer-shaped layers. The eye, then, is, as a rule, at birth hyperopic (perhaps astigmatic), and over-use of the eye in early childhood tends to deform it more. The statistics looking towards the effects of occupation upon the production of myopia are not yet sufficiently studied to warrant a definite conclusion, but we might say in general terms that the prolonged use of hyperopic or emmetropic eyes at near

vision will tend to the production of myopia. The infrequency of myopia among watchmakers may be accounted for by the fact that as a rule watchmakers use a microscope before one eye in viewing the object manufactured.

But the prevalence of myopia among students is proverbial. The effects of school life upon the eyes are dwelt upon at length in the text books, and we may safely relegate this part of the subject to the text books. But I cannot refrain from quoting one or two pregnant remarks. Risley, in Norris and Oliver's "System of Diseases of the Eye," sums up the production of myopia in school life by saying: "The obvious association of the increasing percentage of myopia with the work of the schools seemed naturally to fix the responsibility for the disease upon the educational process, and led directly to efforts for the discovery and reform of faulty educational methods." And again, "The obvious lesson is that our children enter upon their educational training at a too tender age, and that during the first years at school the methods of instruction should be so modified as to avoid as far as possible continuous work at a near point."

The manner in which miners acquire nystagmus has been well observed. The semi-darkness of the mine, the semi-recumbent position of the miner with his head diagonally upward, and the constrained position of all the muscles including those of the eye, produce such a want of harmony in the ocular muscles as can only be expressed by nystagmus.

I, myself, have observed that among the old school potters there usually exists a high degree of hyperphoria. The position of the potter at his lathe is semi-recumbent; he stands upon his right foot with his body leaning upon a back-rest. His left foot is pressed against the tread of the lathe, while his head is bent forward toward the right and his eyes look into the vessel that is being turned, and into which his right hand is inserted. This produces habitual torticollis and a hypertrophy of the lower left rectus and the right upper rectus. A right hyperphoria of 4 degrees is not uncommon among such potters.

I seem to have noticed also a great prevalence of high degrees of astigmatism among the Sisters of Charity. These nuns usually wear a head-dress shaped like an old-fashioned

sunbonnet, the front part projecting from four to six inches in front of their faces, and is lined with white. With such blinkers on the Sisters can only look straight forward or demurely down. There is, therefore, little lateral pressure against the eyeballs, and if the Sister has entered the service early in life, high astigmatism seems inevitable. At any rate, in my observation astigmatism is quite prevalent among them.

We are all familiar with the type of ocular fatigue produced by a change of residence from the country to the city. The visitor from the country unaccustomed to glancing rapidly from side to side at closer range than usual soon fatigues the ocular muscles, producing a nausea somewhat similar to that produced in some cases by a ride upon a street car.

A similar condition is often brought about by the amateur typewriter. The frequent movements of the eyes from the copy to the keys of the finger-board soon produce incoordination. This confusion seems to be produced more rapidly if astigmatism exists, and if the keys be round. Some manufacturers of typewriting machines have noted this fact and now manufacture their machines with octagonal or square keys instead of round ones.

Many other disturbances of the eye from occupation will doubtless occur to you.

I wish to refer to the effect of change of climate upon the eye. I seem to have noticed that persons who have migrated from the south to the north have much more difficulty with their eyes than persons who have migrated along the same parallel of latitude. The population of the Paget Sound district, for instance, is very cosmopolitan; many of the inhabitants are from the southern states, many of them from Mexico. Many of them, indeed, migrate in the summer months to Alaska and return. The effect of this north and south migration, especially during the first few seasons, seems to be productive of retinal congestion, or optic neuritis. This, of course, would be particularly the case if the patient suffered from snow-blindness during his visit to Alaska, and the neuritis would then be accompanied by conjunctivitis and corneitis.

Another peculiarity is the effect upon these patients of

a change from a sunny clime to a cloudy one. The north Pacific coast is foggy and humid. This humidity seems to chill the surface of the body, preventing perspiration. To a person accustomed from infancy to rapid perspiration (such as would be produced by a warm, sunny climate), there would exist a demand for increased activity from the kidneys, and the demand is often greater than the kidneys can comply with. In consequence of this the kidneys often become inflamed and unable to perform their function. Retained products of waste very frequently produce retino-choroiditis and optic neuritis. So, too, in regard to the use of the eyes in this foggy atmosphere; a person accustomed to bright skies finds it difficult to use the eyes at prolonged near work in a climate whose skies are usually overcast by cloud. So that while persons from Scotland, Ireland or Scandinavia have very little difficulty in accustoming their eyes to the climate of Puget Sound, those from the Mediterranean, the southern states and Mexico, have great difficulty in doing so. I ought to observe, however, that the Scandinavians in migrating to the northwest country suffer degeneration in other ways. Dr. Ivar Janson, in the January number of the *Northwest Medicine*, gives a very graphic account of his observations upon his countrymen. He mentions the fact that while confined to their mountains in northern Europe these people live an Arcadian life, becoming vigorous, large and well proportioned, remarkably free from disease. Yet upon migrating to the northwest there is a rapid degeneration physically and mentally. "The proportion of Scandinavians in the hospitals for the insane is quite appalling." "And tuberculosis * * * seems to make up for lost time for past immunity. * * * I give tuberculosis twenty-five per cent. of all the dead of the first descendants of people whose environments and means of sustenance for untold generations had formerly been stable and fixed."

I wish to observe also that persons migrating from the southern Pacific coast to the northern Pacific coast experience at first a peculiar somnolence. In my own case, while a resident of California, five hours' sleep each night seemed ample, and indeed during the summer months three or four hours' sleep nightly was all that

was obtainable on account of the heat. But at Seattle nine hours' sleep nightly seems indispensible—ten hours desirable. This "letting down of the nerves" has a peculiar effect on the habits. At Victoria the older business houses open at 10 A. M. and close at 2 P. M., and the major portion of the time is spent in eating and sleeping. A noteworthy change is observable in women. Women who in California are unable to conceive usually become quickly pregnant upon migrating to the Puget Sound country. Women seem, however, to reach the menopause early in the north, often as early as the thirty-fifth year, though girls are slower in reaching puberty. Puberty is sometimes delayed until the twentieth year. These changes in the "habits of the nerves" have a profound influence on the eyes, inducing among other phenomena very early manifestations of presbyopia.

In the far north—in Alaska for instance—the monotony of the long dreary nights in winter induces profound neurasthenia, particularly in women; and in all classes prolonged confinement indoors, and continued efforts at reading to kill time, make their injurious impression on the eyes.

Not to extend this paper unduly, let me close with the remark that what I have said has been said not to exhaust the subject but to call forth a discussion.

RARE OCULAR LESIONS IN SCARLATINA.*

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THE ocular lesions that occur in scarlatina are of particular interest for the reason that they are generally of a more or less serious nature. Scarlet fever, unlike diphtheria, is a disease that the average specialist does not come in contact with. It is handled in nearly every case by the general practitioner, and it is only when the eye symptoms are of a prominent character that a specialist is called in, and as a result the connection between many eye diseases and scarlet fever is lost sight of. Among the rarer lesions we have

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uræmic amaurosis, purulent inflammation of the vitreous, phlegmon of the orbit, and thrombosis of the cavernous sinus.

In uræmic amaurosis, which occurs more frequently than the other lesions, the blindness comes on suddenly and gets to be complete within a few hours or a day. After one or more days the sight is gradually restored.

Simultaneously with the attack of visual disturbance other nervous symptoms exist, such as headache, vomiting, dyspnœa, loss of consciousness and convulsions. The fact that the reaction of the pupil to light is in most cases preserved in spite of the complete blindness, proves that the location of the affection cannot be in the eye or in the optic nerve, but higher up—that is, in the brain, which is poisoned by the excretory matters contained in the blood. Cases are reported by Ebert,[1] Förster,[2] Monod,[3] Power,[4] Loeb[5] and Martin[6]. These cases were quoted by Förster,[7] who called attention to the fact that in all of them albuminuria was present, and that the amaurosis occurred in the desquamation stage after a period of generally favorable symptoms. The amaurosis was ushered in by cerebral symptoms, headache, convulsions, vomiting and stupor. It came on suddenly, was bilateral, and for a time was complete. No ophthalmoscopic lesions were detected, and the blindness gradually cleared off.

Purulent inflammation of the vitreous or suppurative hyalitis is the product of a metastatic choroiditis, which sometimes follows in the wake of scarlet fever. In this lesion if the cornea is clear, a yellowish reflex is seen shining through the pupillary space, there is retraction of the periphery of the iris and bulging of its pupillary border. Usually one or two synechiæ are present and the tension is diminished. In addition to this, there may be a pericorneal zone of congestion connected with the inflammation of the iris and ciliary body.

When the pus in the retina is circumscribed the symptoms at the first glance are not unlike those of glioma of the retina, and the name pseudo-glioma has been given to this condition, especially as it is seen in children.

In phlegmon of the orbit we have an inflammation of the cellulo-fatty tissue surrounding the eyeball. It is of metastatic origin and is generally of the acute form. It is usually

monolateral, although it may be bilateral. Constitutional symptoms generally accompany it, such as chills and fever, and not infrequently cerebral symptoms, such as headache, vomiting, mental hebetude, retardation of the pulse, etc. The local symptoms are exophthalmos, limitations in the movements of the eye and swelling and œdema of the lids, together with hyperæmia and chemosis of the conjunctiva. When the symptoms have reached their acme the skin of the lids at a certain spot grows red, then shows a yellow discoloration, and finally is peforated by a discharge of pus. After the evacuation of the pus, which is present in large quantity, the inflammatory symptoms in most cases rapidly subside and the opening soon heals again. The sight may suffer permanent diminution or be altogether annihilated, if the optic nerve is implicated, for, inflammation of the optic nerve or thrombosis of its vessels may develop, succeeded by atrophy of the nerve. Detachment of the retina and even panophthalmitis, also, occasionally occurs in retrobulbar phlegmon. If the suppuration is carried over from the orbit to the cranial cavity it leads to a fatal issue through purulent meningitis or abscess of the brain.

In thrombosis of the cavernous sinus we have a lesion which from the pathologist's view-point is of particular interest. That the lesion is a rare one is shown by the literature on the subject, there having been only 182 cases the result of various causes reported up to date. Of this number only fourteen recovered. The lesion is set up metastatically. The symptoms are very prominent and are similar to those which present themselves in the beginning of a retrobulbar phlegmon. The lids and the conjunctiva swell up with œdema, and the eyeball is protruded and becomes hard to move. The veins of the retina are seen, upon ophthalmoscopic examination, to be distended enormously with blood. These symptoms are referable to the fact that the veins of the orbit discharge the greater part of their blood through the ophthalmic veins into the cavernous sinus; if the latter is occluded an extreme degree of venous stasis in the orbit necessarily takes place and leads to protusion of the eyeball and also to venous hyperæmia of the retina. At the same time there may be a doughy œdema in the mastoid region. This œdema

depends upon the fact that in this region an emissary vein of Santorini empties into the transverse sinus and thus indirectly into the cavernous sinus, so that when there is occlusion of the latter this region also shares in the venous stasis. When this œdema is present it forms an important diagnostic sign between thrombosis of the cavernous sinus and retrobulbar phlegmon, in which latter it is absent. A further point of difference lies in the fact that thrombosis of the sinus frequently passes over to the other side, so that the same complex of symptoms develops there also, while, on the contrary, a bilateral orbital phlegmon would be one of the greatest rarities.

Wells and Germain [8] report a case that was operated upon, the cavernous sinus exposed, incised and drained. The patient died, but they claim that by the operation they demonstrated that the sinus is not inaccessible, that it may be reached without grave danger to the patient, and at least a low mortality from the operation itself, that it can be done under almost primary anæsthesia, not associated with any degree of shock, finished within a few minutes—in their case eight—and that the hæmorrhage is easily controlled. They also claim that an incision into one sinus instantly and completely relieved the interference with the circulation in both.

Retinitis albuminurica occurs after scarlatina, but is not frequent; it is more a complication of the chronic form of Bright's disease than of the croupous nephritis which is found in scarlatina. The prognosis is more favorable than in albuminuric retinitis unconnected with an exanthem, but partial optic atrophy has been observed [9].

The sight can also be affected as the result of scarlatina without the presence of albuminuria or any evidence of any kidney disease, as in the cases recorded by Hodges [10], where thrombosis of the central artery was observed in one eye of a growing girl while recovering from scarlatina. In this case the urine was normal, so that the ocular lesion may possibly be attributed to debility induced by the disease.

Pflüger [11] has observed papillo-retinitis after scarlatina without kidney affection, and the same phenomenon has been observed by Betke [12] though in the latter case the patient had suffered at an earlier period from hemiplegia. Leber [13] re-

ports a case of a boy who became blind without ophthalmoscopic signs and with normal urine. The only assignable cause was latent scarlatina, and Leber seems to regard this peculiar case as somewhat analogous to the post-diphtheritic lesions in other nerves.

Occasionally accommodative asthenopia shows itself after scarlatina as it does after measles. It may persist for a long period of time even after the general health is completely re-established. Förster instances the case of a boy of 9 years who suffered from caries of both temporal bones and complete paralysis of both facial nerves. Both corneæ were destroyed in consequence of the lagophthalmus, and the unfortunate patient became blind as well as deaf. Fuchs, in his text book, states that suppurative choroiditis of metastatic origin may occur in scarlatina as in typhus, variola, etc. In most, if not in all of the recorded cases, suppurative otitis has preceded the choroiditis (or retinitis). Phillips[14] has observed an œdema of the upper eyelid during scarlatina which also is apparently associated with suppurative otitis. The swelling was not white and doughy as in renal dropsy, but tense and livid, and in the cases recorded it was more marked before rupture of the membrana tympani, and increased afterwards if the discharge from the ear became less free. Phillips considers it probable that the affection is connected with thrombosis of the cavernous sinus.

As the result of this brief study of the more rare eye lesions that occur in scarlatina we are justified in arriving at the following conclusions:

First. In view of the fact that scarlet fever is one of the most common of the exanthemata, and that the majority of eye lesions occurring in connection with it are of a serious nature, involving not only loss of vision but in some cases life itself, greater attention should be given them than they generally receive.

Second. That if the operation on the cavernous sinus can be made without grave danger to the patient, and with the chance of lessening the mortality as claimed by the operators, such an operation is justifiable and should be performed.

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[11] Pflüger, Neuritis Optica, Archiv für Ophthalmologie, Bd. XXIV. 2, S. 180.

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SOME RARE OPHTHALMIC CASES.*

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I. CONGENITAL ANOPHTHALMOS.

BABY C., female, was born in St. Louis on August 25, 1902. The mother was in labor twenty-four hours, and the delivery was instrumental. This was her first child. The mother was shocked by the death of a friend in January, and by a fire in February.

When one week old this child was examined by me at the request of the family physician, Dr. W. F. Kier. I found

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the babe entirely well formed with this exception—the eyeballs were absent. The lacrimal glands were enlarged and tears appeared when the lids were held apart. The conjunctiva was of normal appearance and extent. Owing to the absence of the eyes there was a sunken condition of the lids, which is shown in the accompanying photograph. In front of each ear was a small, hard lump which was about one-half inch in diameter. Apparently these were inflammatory thickenings. They did not disappear. The little patient died in February, 1903, from inanition. Whether the masses were rudimentary eyeballs could not be determined, since a post-mortem examination was refused.

FIG. 1.—Congenital Anophthalmos.

Cases of congenital anophthalmos are of very infrequent occurrence. Von Hippel[1] has collected sixty-four cases of bilateral and twenty-three of unilateral congenital anophthalmos. In the twenty-three unilateral cases the other eye was normal in fifteen, four eyes were microphthalmic, one presented coloboma of the iris and chorioid, one showed a high degree of hypermetropia, and one presented an anomaly of the optic-nerve sheath.

II. DISCOLORATION OF THE CORNEA WITH BLOOD PIGMENT.

This is a rare and peculiar condition of the cornea—one which involves some nice points in diagnosis and which has been made the subject of study by such eminent observers as

Vossius,[2] Treacher Collins,[3] J. B. Lawford,[4] J. E. Weeks,[5] and John Griffith[6].

Mr. Wm. C., aged 37, native of Ireland, a blacksmith, was admitted to the St. Louis City Hospital in April, 1900. Two years before this time, while operating a punching machine, a piece of steel struck the right eye. The steel was a large piece and dropped from the eye. It is supposed that no part of it remained in the eye, although the history is indefinite. The eye was treated by a physician, and the patient states that one month after the injury an operation was made on this eye. He states that up to this time the injured eye was of the same color as its fellow, but immediately after the operation the right eye became of a reddish-brown color as at present. Before this time he could read large print with the right eye; immediately after the operation vision was reduced to light perception.

At the time of my examintion of this case the entire cornea was of a brick-dust color. Oblique illumination showed the presence of wavy lines of vessel-like structures, which were probably distended lymph-channels.

In case of blood-staining of the cornea there is first a blood clot in the anterior chamber due usually to trauma or operation, although the hæmorrhage may have occurred spontaneously in old cases of retinal detachment. In nine of seventeen cases mentioned by Collins the tension was increased; in six others it was normal or minus. The phenomenon may occur at any age.

As regards diagnosis, it will be necessary to distinguish between hæmorrhage into the anterior chamber, forward dislocation of the lens, and blood-staining of the cornea. When the whole cornea is stained it cannot be distinguished from distension of the anterior chamber with blood, but if a peripheral clear zone is present the distinction can be made. When the central part of the cornea is of a rusty-brown color from blood-staining and the periphery is clear, the condition so much resembles that of an amber-colored lens dislocated forward that the best observers have been in doubt. It would seem that focal illumination ought to be of value in making the diagnosis.

As regards the nature of the pigment which is distributed

through the cornea, the micro-spectroscopic and chemic examinations of Collins show the discoloration is due mainly to crystals of haematoidin. with or without haemosiderin, which enter the cornea in solution in blood diffused through Descemet's membrane. After a period varying from two to many years the discoloration disappears, the periphery being the first to clear up. Treatment of this condition seems to be useless, although alteratives may be tried.

III. A CASE OF MELANOSARCOMA OF THE LOWER EYELID.

Miss C. D., of Jennings, Mo., aged 22, came to my clinic in February, 1903. When three weeks old she had a "gathering" in her left nose with discharge of pus. When the swelling subsided a small black spot remained just below the tendo oculi of L. E. After taking cold it was larger. Ever since she can remember there was epiphora of L. E. She came to me on Feb. 10th with pain and inflammation of inner canthus and adjacent skin tissues. A fluctuating oval tumor measuring 6x8 mm., was situated immediately below the left tendo oculi. This cyst I opened with a von Graefe cataract knife, evacuating about one drachm of yellowish fluid. The diagnosis of dermoid cyst connected with the upper part of the naso-lacrimal canal was made.

After evacuating the fluid the dark cyst walls remained. The cyst refilled until one week later the lower canaliculus was slit and a lacrimal probe was passed. This evacuated the fluid in the cyst. Ten days later I excised the growth. A microscopic examination, which was made by Dr. Carl Fisch, showed the mass to be a melanosarcoma.

[1] Die Missbildungen und angeborenen Fehler des Auges. Leipzig, 1900.

[2] Vossius—Archiv für Ophthalmologie, Band xxxv., Abtheilung ii, S. 207.

[3] Lawford—Transactions of the Ophthalmological Society of the United Kingdom, vol. viii., p. 60.

[4] Collins—Ibid., vol. xi , p. 43.

[5] Weeks—New York Eye and Ear Infirmary Reports, vol. i., part i., p. 37.

[6] Griffith—Transactions of the Ophthalmological Society of the United Kingdom, vol. xiv., p. 74.

ON CONGENITAL "DEFECTS OF MOTILITY" OF THE OCULAR MUSCLES.—REPORT OF TWO CASES.

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WHILST congenital ptosis and nystagmus are relatively frequent and therefore have been studied for a long time, it is only of late that congenital affections of the extrinsic eye muscles have found due consideration. The first collection of such cases and the sharp limitation of the clinical picture we owe to Dr. Carl Kunn (Deutschmann's Beiträge zur Augenheilkunde, 1895). He collected seventy-three cases including seven of his own, and later added twelve more. (ibid. 1895 and 1897.)

Nevertheless, the subject is very briefly considered in the text-books appearing after this date. Landolt, in Norris and Oliver, dismisses it with the few sentences: "Mention should also be made of the *congenital paralyses* of the ocular muscles. They are not so rare as seems to be generally supposed. Schapringer (New Yorker Medicinische Monatschrift, Ueber angeborene beiderseitige Pleuroplegie, December, 1889) relates a case of congenital paralysis of the sixth and seventh pairs (abducens and facial)."

De Schweinitz (ed. 1902) says: "A number of cases of *congenital palsy*, especially of the external rectus, have been observed, which in some instances may have been due to a lesion affecting the nucleus of the implicated nerve during intra-uterine life. In addition to this there are anomalies of the external muscles depending on their abnornal insertions. Entire absence of a muscle has been noticed. Occasionally cases of orbital muscle palsy have been attributed to various so-called *reflex disturbances*."

Fuchs touches on at least some of the vital points by saying: "Paralyis of the ocular muscles may be of *congenital* occurrence. Mention has already been made of congenital ophthalmoplegia. The most frequent congenital paralyses are those of the abducens. It is a remarkable fact that in these, contrary to what takes place in acquired paralysis, contracture of the antagonists does not set in; both eyes have a perfectly proper position as long as the gaze is not directed

towards the side of the paralyzed muscles. An inability to turn the eye upwards has been observed occurring coincidently with congenital ptosis. Autopsies have shown that in this case the rectus superior was absent. Perhaps in this case, as in many other instances of congenital paralysis, the primary disease is to be looked for in the nerve nuclei (Moebius)." In the new Graefe-Sämisch (chapter on muscles, by Alfred Graefe), I could find no mention of the subject.

On the other hand, Panas, in his edition of 1894, deals with the subject quite extensively, quoting mainly from Mauthner, who in his monograph on ocular paralysis, 1889, devotes two pages to congenital affections. Mauthner foreshadows the conclusions arrived at by Kunn by stating: "From these premises it follows that, if extrinsic ophthalmoplegia develops after birth it is undoubtedly due to a disease of the nuclei, but if the affection is undoubtedly a congenital one, an anomaly or absence of the eye muscles may be the cause." Kunn tried to make the division between these two forms more pronounced by excluding the latter from the general head of paralyses and by choosing for them the term, "Defect of Motility" (Beweglichkeitsdefekte), and his convincing arguments lead me to adopt his nomenclature.

The two following cases have come under my observation within the last five years:

C. R., boy, æt. 6 years, seen in 1899. Vision about normal in each eye (tested by dots and pictures). Ref., obj. + 1.0 s. Fundi normal.

In the right eye, ptosis of medium degree. Eyeball cannot be moved upwards, and very moderately inwards. The movement downwards is somewhat better, accompanied by a rotatory motion (action of the superior oblique). When looking straight forward the axes appear parallel; sometimes there seems to be a very slight divergent strabismus. When looking to the left the strabismus increases. Double pictures cannot be elicitated. Pupillary reaction and accommodation normal.

This condition has been noticed since birth. The boy has sisters and brothers, and it was stated that they, as well as the parents, were not affected in a similar way.

A. D., girl, aet. 10 years, seen first in 1902. Vision in right eye $^{6}/_{60}$, after correction $^{6}/_{20}$. (−1.5 s. ⌒ + 3.0 cyl. ax. 70°) Vision in left eye $^{6}/_{20}$, after correction $^{6}/_{12}$. (−1.0 s. ⌒ + 2.5 cyl. ax. 115°) Reads Sn I with each eye after correction. Fundi normal.

There is rotatory nystagmus in both eyes. The eyes can be moved to the right as well as to the left in a limited degree only. The motion upward lags also behind, but is somewhat better. Downward it seems to be about normal. On a second visit, one and a half years later, the extent of the movements was measured with the perimeter and was found:

R. E.	Mesially, 20°.	Laterally, 10°.
	Upward, 35°.	Downward, 55°.
L. E.	Mesially, 25°.	Laterally, 20°.
	Upward, 40°.	Downward, 55°.

The convergence is intact. Patient can converge up to 10 cm.

The pupillary movements and the accommodation are also normal.

Double pictures can not be elicitated by any of the usual methods.

Patient is the only child of her mother, but has one half-brother and one half-sister. According to their histories there is no similar defect in any other member of the family.

In the first case we have a paretic condition of the levator and of the extrinsic muscles controlled by the motor oculi. The movement downwards was accomplished mainly by the superior oblique. The intrinsic muscles, sphincter iridis and ciliary muscle were intact. This feature invariably has been found in congenital motor deficiencies. The affection was unilateral.

In the second case both eyes were affected, but the right eye slightly more than the left. The levators were free. Besides the nystagmus, not only the extrinsic muscles controlled by the III. nerve, but also the external recti were affected. Here, again, the superior oblique muscles seemed to possess the strongest functional power. The pupillary movements and accommodation were likewise unaffected.

Another characteristic feature in this case was the integrity of the movements of convergence which could be exe-

cuted easily to the normal near point. The same internal recti, which showed insufficient action in the associated movements, functionated perfectly in the conjoined movements. Such a condition is remarkable and is also pathognomonic for congenital lesions, as it has never been found in acquired pareses. I shall refer to this point later on.

I therefore consider these two cases congenital ones, less on account of the history given than because of the characteristic features. We all know how unreliable the former is; frequently the condition is not noticed at once, and when observed later on is attributed to some incidental disease or a trifling accident. Furthermore, after the appearance of Moebius's communications on "Infantile Nuclear Atrophy" (Ueber infantilen Kernschwund), it was held by many that this acquired disease of the nuclei of the motor nerves was responsible for the large majority of these cases. It is, therefore, the merit of Kunn to have demonstrated that besides the history, which must be taken *cum grano salis*, there are objective symptoms by which these two clinical pictures can be distinguished.

The points for differential diagnosis between congenital defects and acquired nuclear paralyses are:

(1) In the congenital forms, frequently a palsy of the associated movements is found while the convergence remains intact. In the acquired this strange relationship is never met with. My second case is a typical illustration. A satisfactory explanation of this phenomenon is still wanting.

(2) In the latter, sooner or later, secondary contraction of the antagonist takes place, causing strabismus; in the former, no contraction takes place, and we frequently find, therefore, parallelism of the axes in the primary position (when looking straight forward).

(3) Congenital defects are frequently one-sided, while infantile nuclear palsy always affects both sides.

(4) The congenital are frequently accompanied by other defects of development, e. g. facial paresis, etc.

(5) In the acquired palsies there are double pictures; and if one picture is habitually suppressed, and therefore no double vision complained of, it can easily be elicitated by our usual tests. In the congenital, the eyes never acted together,

there was never binocular vision; therefore double pictures cannot be elicitated. In the second case, where the patient was old enough to give intelligent answers we made long and careful tests, but with the usual negative results as to double vision.

The congenital form affects frequently some members of the same family; the acquired are isolated cases only.

The above reasons are sufficient to separate the congenital deficiencies as a group *sui generis* from all acquired palsies. The different forms of it are: simple ptosis, uni– or bilateral; ptosis combined with a paresis of one or more branches of the motor oculi, i. e., those controlling the extrinsic muscles, the intrinsic ones remaining intact always; finally, complete ophthalmoplegia exterior, where the external recti and superior oblique are also involved. Then, isolated paresis of the abducens, uni- or bilateral, is found; here ptosis is always absent.

As to the relative frequency, uncomplicated ptosis and uncomplicated nystagmus rank first; then, affections of the abducens, and finally those of the motor oculi, with or without ptosis, up to complete ophthalmoplegia exterior.

Our knowledge of the causes of these congenital defects is a limited one. In a number the defect was found to be a muscular one. Already, in the eighteenth and in the first half of the nineteenth century, some cases were published where, at the post-mortem, absence of ocular muscles or nerves was demonstrated. The oldest one, possibly, was related by Olbers, in 1781, in a dissertation. He describes a case where both eyes could not be moved to the left since birth, and where Wrisberg found at the autopsy that the internal rectus of the right eye and the external rectus of the left were entirely wanting. Stellwag, in his text-book, mentions some instances of absence of external muscles and nerves in case of microphthalmia. In other cases, after the introduction of operative procedures, the defect was discovered during these.

Dieffenbach, the father of tenotomies, reports an instance of bifurcation of the internal rectus in the orbit, and some others where the muscles were inserted far back and poorly developed.

A more minute description is given by Baumgarten (Ammon's Monsch. f. Augenh. u. Chir., 1840): "During the operation, which was done in two sittings, there were found, instead of an internal rectus, thin but firm fibrous cords running in the direction of the internal rectus, between conjunctiva and sclera. They appeared too fibrous to be taken for muscular tissue, but too firmly organized for membranes. An anomalous insertion of the muscles was out of the question; I had to deal with a substituted tissue. Instead of forming one large muscular band, the individual fascicles were spread out as isolated muscular fibres, the interstices of which were filled with connective tissue."

Steinheim (Klin. Monblt. f. Augenh., 1877) found that the superior rectus of one eye was entirely wanting, and drew the conclusion from the clinical picture that the superior rectus and the levator palpebræ of the fellow eye were likewise absent.

Uhthoff (Jahrb. v. Schœler's Klinik, 1881) reports a case where in both eyes the internal rectus was very rudimentary, a thin, dense cord. The tendon was only one-third of the normal size and inserted at the normal place. The presence of striated muscular fibres could not be demonstrated in spite of dissecting way back. The tendons of the external recti were very broad. The condition was identical in both eyes.

Lawford (Ophth. Review, 1887) found at the post-mortem of a man, who had been affected throughout his entire life by a deviation of both eyes to the right side, that the internal rectus of the right eye was entirely absent, and that the external rectus of the left eye was very rudimentary.

Kunn (l. c.), in a girl of 12 years, discovered instead of a levator muscle a delicate cord of connective tissue, and in an excised piece, no trace of muscle fibre could be demonstrated under the microscope.

Bernhardt (Neurol. Centrbl., 1890) was the first to communicate the findings of the nervous apparatus. A boy 5 months old showed since birth a facial paralysis of the right side. He was unable to move the right eye laterally and it stood fixed in an inward deviating position. The left eye was in a similar position but could be moved laterally to

a certain extent. In consequence of anæsthesia in the area of the trigeminus, a neuro-paralytic keratitis developed later on. Patient died a year afterwards of bronchitis. There was found a round focus of softening in the right half of the pons, and another which had destroyed the lower part of the right corpora quadrigemina totally, and the upper nearly so. The nuclei were found intact by microscopical examination as well as macroscopical. This latter finding is the most interesting in this case. It proves that the lesion must have been located more centrally. The connection between the paralytic condition and the destruction in the corpora quadrigemina remains open to discussion, because our anatomical knowledge relating to the course of the sixth nerve between its cortical centre and its nucleus is insufficient.

The foregoing data seem to be all that have been published that give us a clew as to the cause of these congenital defects. While they are not many their harmony is of value, and they prove without doubt that in a certain number the deficiency is a muscular one. But it is hardly permissible to extend such a supposition to all cases, and certainly in a larger number, it is the nervous apparatus which is at fault. This applies, first of all, to those instances where the associated movements are involved, while the convergence remains unaffected. For we can hardly assume that a muscle, which is atrophic or wanting, and is therefore unable to functionate for one movement, could do so for another,

Here the lesion must lie in the centers which govern the coordinated movements. Whether in the other cases, the lesion is a nuclear, subcortical or cortical one can only be conjectured. The relative frequency of acquired nuclear paralysis might speak in favor of the supposition that the nuclei are at fault in the majority of the congenital deficiencies also; the only evidence we possess (Bernstein) does not support such an assumption, and further additions to our knowledge must be awaited.

As to the therapeutics, the best procedure in deficiencies is *noli me tangere*. The operations which have been performed in such conditions have not given satisfactory results.

ASTIGMIA OR ASTIGMATISM—WHICH?

By SWAN M. BURNETT, M.D., PH.D.
WASHINGTON, D. C.

THERE can be no question that much of our nomenclature in ophthalmology is sadly lacking in precision and accuracy.

It must be evident that a name, especially where something like scientific precision is expected, should carry a definite meaning and serve as a means of differentiation from all other things, even though it be not accurately descriptive; the least that should be demanded of it is that it should not be misleading. Many of our names in ophthalmology have come down to us from an antiquity more or less remote, and having become firmly established in usage and thereby acquired a clearly defined meaning not applicable to anything else, can very well be allowed to hold their places even though their derivation be fanciful or far-fetched. Among these in the domain of refraction are myopia, presbyopia, and I would be willing to add hypermetropia, since by a stretch of definition it can be made to apply to an eye with its far point beyond (above) the standard measure of infinity.

It may be further conceded that any change in an accepted nomenclature should be allowable only when there is some definite gain in clearness to be arrived at or an obvious error to be corrected.

There is one term, however, in common use in ophthalmology to which custom, backed by the most eminent authority, has given the stamp of its approval to which none of these justifications apply, and which should not, in view of the facts, be allowed to stand without a protest which should not be regarded as either pedantic or hypercritical. That term is "Astigmatism," which is intended to define that optical condition in which rays eminating from one point are not all again united (positively or negatively) in another point.

According to our highest authorities in ophthalmic optics the term has its derivation from "*a*—privative, and *στιγμα*—a point." Donders states in the introduction to his little book, "Astigmatism und cylindrische Glæser," published in Berlin in 1862 (translated from the Dutch by Dr. C. Schweig-

ger): "Rev. Dr. Whewell hat, wie Mackenzie mittheilt, das Gebrechen, welches Airy von seinem linken Auge beschreibt mit dem Namen Astigmatismus bezeichnet, Dies Wort ist abgeleitet von *a*, privatum, und *στιγμα*, von *στιζω*, (Latin *pungo*), und soll ausdrücken, dass Strahlen die von einem Punkte ausgehen, sich nicht wieder in einem Punkte vereinigen" (p. 10).[1]

Referring now to Mackenzie we find on p. 927 of the fourth edition of his "Treatise on Diseases of the Eye," published in 1854, the following statement: "Having occasion twenty years after the first account of the malformation of his left eye was submitted to the Cambridge Philosophical Society, to explain that a change had happened in the state of the eye, Mr. Airy took an opportunity of mentioning that as the nature of the effect of the malformation was that the rays of light coming from a luminous point and falling upon the whole surface of the pupil did not converge to a point at any position within the eye, but converged in such a manner as to pass through two lines at right angles, the Rev. Dr. Whewell affixed to this phenomenon the term *astigmatism*."[2]

So it appears we have to go back to England, not only for the first accurate description of this peculiar form of optical refraction in the eye (in Young and Airy), but also for its name.

Now, whether Whewell or Donders or some one else originated the method of its derivation from the Greek, I have been unable to discover. It is evident, however, that he, whoever it was, took *στιγμα-ατος* to mean a *point*, in the sense of a mathematical point.

It is true that the root of *στιγμα* is *στιζω*, which means "to prick or puncture," as well as "to burn a mark in, to brand—passive, to be spotted," but only in the sense of a disfigurement as to tattoo, and it is in this sense of a mark or taint that the word has become commonly accepted. Liddell and Scott, the acknowledged authorities in this country at least, make *στιγμα* to mean "a prick or puncture of a pointed instrument, a brand, a mark; generally a mark—spot."

In making the selection of the Greek word from which to derive the term descriptive of the condition, the origina-

tor evidently overlooked the fact that there was another substantive derived from the same root, στιζω, which had the very meaning he was in search of, namely, στιγμη-ης, which, according to Liddell and Scott, means "a prick, mark, puncture, a *mathematical point:* (Latin, *punctura*)." Besides, the Greek word στιγμα has been transferred bodily to our language with the definite meaning of a mark or stain, as when we speak of the "stigma of crime or guilt." It is also current in our medical literature, as when we refer to the "stigmata of scrofula, syphilis, etc." No such definition attaches to στιγμη, which still retains its meaning of a point—and what is more pertinent to our needs, a mathematical point, and synonymous with the Latin *punctum*.

The only possible excuse that can be offered for the retention of "Astigmatism" is that it is already established in usage and is sufficiently exact for practical purposes. This, however, can hardly be considered valid in the light of what has been shown above as to the undoubted incorrectness of the term in its accepted meaning of something entirely different from the idea meant to be conveyed. We surely do not wish to convey the impression, when we refer to an eye suffering from "astigmatism," that it is "without spot or blemish." Moreover, in this branch of medical science we are supposed to stand for mathematical precision, and the stigma of inaccuracy is upon us if we fail to meet the requirement in every case. It should never be too late to reform a bad habit into a good one, or to abandon an erroneous position when once the error is clearly demonstrated.

Furthermore, it appears that Whewell himself became convinced that the word he had introduced was not etymologically correct, and approved of another shorter and less open to objection on the ground of derivation. Apparently it was Dixon who first called attention to the error and suggested another word more in keeping with the correct derivation. In his article on vision in "Holmes's System of Surgery," Vol. III., p. 21 (note), Lea Bros. & Co., 1881, he says: "Astigmism would be the more correct term, στιγμη (στιγμης), being commonly used by Greek writers to express a geometric point, while στιγμα (στιγματος) always signifies something material, more or less visible or tangible

—a puncture, mark or spot. I took the liberty of pointing this out to the late eminent scholar, Dr. Whewell, who had originally suggested the word astigmatism, and he approved of astigmism as being etymologically the better formed word."[3]

It is evident that Whewell had hastily and apparently without due consideration selected a word which he found out afterwards not to be the correct one, and thus fastened upon our nomenclature a term which we, with a reverence for authority, which seems in this case not to have been justified, have slavishly continued to use.

It probably should be mentioned that this word, astigmism, as the synonym of astigmatism, is to be found in the Century Dictionary with a reference to "Notes and Queries," 1886, where it is recorded as appearing in "Additions and Amendments to the New English Dictionary."[4] It is also to be found in "Dorland's Medical Dictionary," 1900, as a synonynm, also in "Dunglison's Medical Dictionary," 1903, which also gives astigmia. It may be found elsewhere though I have not been able to discover it. But so far the attempt to introduce the term "astigmism" has not been followed by any measure of success. And it is perhaps well that this has been so, for while etymologically there may be nothing against it, it fails in one important point, and that is in terminology.

By convention all words associated with or descriptive of the optical conditions of the eyes or their motility, end in *ia*. Thus we have myopia, asthenopia, esophoria, esotropia, etc. In uniformity with these we should have "astigmia."

The proper adjective to the term would be "astigmic," a word preferable in every way, aside from its correctness, to "astigmatic."

Then, again, aside from its entire correctness the new word commends itself for its shortness, crispness and euphoniousness, in marked contrast to the long, uncouth and barbaric sound of the other, which reaches the limit in the German "Astigmatismus."

We find, once again, that "they order this matter better in France." In the number of the *Ann. d' Ocul.* for March, 1895, Dr. Georges Martin, of Bordeaux, suggested the French word

"Astigmie," as a substitute for the incorrect and cumbersome "Astigmatisme," giving the reasons therefor, and citing the authority of such eminent French Helenists as M. Ouvriè and M. Monnier in support of his contention. He gives examples of words similar in derivation from the Greek, having a like termination, as for instance, *a*—privative, and *φωνη*—voice—aphonie. The English of this is, of course, aphonia. Since then several other writers in French have used the term, and in a recent article in the *New York Medical Journal* (1903, No. 6) Dr. G. J. Bull of Paris has brought it to the attention of the profession in this country. Already several prominent ophthalmologists in the United States have announced their preference for and their determination to use the correct term, astigmia. Prof. H. Knapp, to whom we are indebted for the first thorough and scientific investigation of the asymmetry of the refracting media, informs me, through a second communication, of his intention to do so. Dr. Edward Jackson of Denver favors the change, as does also Prof. A. A. Hubbell of Buffalo; and there are no doubt many others of equal prominence not known to me who have adopted the new term.

In the interest of exactness, correctness and uniformity of nomenclature it is hoped that ophthalmologists everywhere will lend their influence towards a general use of the term which commends itself in so many ways for adoption. Only a little effort is necessary to supplant very soon the old, unsuitable word by the new and correct one.

[1] The first actual mention by Donders of the word, however, is in an article in "Graefe's Archiv," B. VII., Abt. 1, 1860, p. 176, under the heading, "Astigmatismus," though throughout the text he uses the word "astigmatisme" He gives, also, the derivation from the Greek as above, and credits it indefinitely to "Englische Autoren." This is, so far as I can determine, the first use of the word in German. Hirschberg in his "Wörterbuch der Augenheilkunde," 1887, gives "*στιγμα* oder *στιγμη*." Evidently he disapproves of the accepted derivation and says: "Wer aber findet ein Deutsches Wort für Astigmatismus?"

[2] The exact words used by Airy were as follows: "(A geometrical phenomenon to which the term astigmatism was very happily affixed by the, present master of Trinity College)." Trans. Cambridge Philos. Soc. 1846. The manner of the derivation of the word from the Greek is not given.

[3] As Whewell died in 1866 it is evident that the error in the derivation of the word was discovered very soon after the appearance of the work of Donders in 1862. It seems unaccountable that the matter was not taken

up by other investigators, but in no text-book at my command is it even referred to. We have all blindly followed Donders.

'The statement in "Notes and Queries" is as follows: "Astigmatism (no history of the word), Astigmism (not in dictionary, 1870)." The late eminent scholar, Dr. Whewell, who originally suggested the word astigmatism, approves of astigmism as being etymologically the better word. (Dixon in "Holmes's System of Surgery," Vol. III. second edition, note p. 7, 1883). Astigmism is also given as a synonymn of astigmatism in "Quain's Dictionary of Medicine."

ABSTRACTS FROM MEDICAL LITERATURE.

By W. A. SHOEMAKER, M.D.
ST. LOUIS, MO.

TREATMENT OF ATROPHIC RETINÆ WITH RETINAL EXTRACT.

Robert W. Doyne (*British Medical Journal*, July 25) had a case of retinitis pigmentosa with a great loss of central vision and contraction of the field of vision, who took a sea voyage which produced violent retching and vomiting; after a night's rest there was great improvement in his vision, which lasted several weeks. Believing this to be due to the increased amount of nutrition brought to the starved retina through the congestion produced by vomiting, the author conceived the idea of supplying the retinal constituents by feeding the patient with raw retinæ of sheep and oxen. Great improvement has been noted in cases of retinitis pigmentosa, retinal degeneration in high degrees of myopia, in choroiditis, and tobacco amblyopia. The extract prepared under the name of "Optocine" has, according to the author, all the value of fresh retinæ.

A NEW OPERATION FOR DETACHED RETINA.

Leopold Miller (*Münchener Med. Wochenschrift*, June 9) has operated on seven cases with excellent results. The method consists of three steps: (1) Temporary resection of the external margin of the orbit according to Krönlein. (2) Exposure of the bulbus. (3) The excision (posteriorly) of a

small portion of the sclera (a piece 8 to 10 mm. broad by 20 mm. long); the evacuation by puncture of the subretinal transudate through the site of the removed portions of the sclera; and the union by sutures of the edges of the excision so as to put this coat of the eyeball somewhat upon the stretch. While, by this method, it is not possible to evacuate all of the subretinal fluid, experience has shown that the portion which remains is rapidly and completely absorbed. The anterior chamber is not abnormally deepened, as might be expected, by the operation.

PLASTIC ARTIFICIAL VITREOUS IN MULES' OPERATION.

E. L. Oatman, (N. Y. Academy of Medicine, Ophthalmic Section, Nov. 17, 1902) reports three cases in which paraffin, with a melting point at 120° F,, was used instead of a glass ball. He says this modification of Mules' operation requires more extended trial before its value can be estimated, and draws the following conclusions:

Paraffin used for this purpose is prone to produce a fistula by softening and getting between the lips of the wound, or into the track of a suture. These accidents are to be avoided by using paraffin, or some modification thereof, that will not soften at body temperature; also by so suturing the scleral wound that no aperture remains through which paraffin can exude. A plastic material like paraffin will adapt itself to any inequalities on the surface of the glass shell, and ulceration from pressure is not apt to occur. Paraffin beads are easily prepared, and may be used in special cases in which glass beads of the required shape or size are not obtainable.

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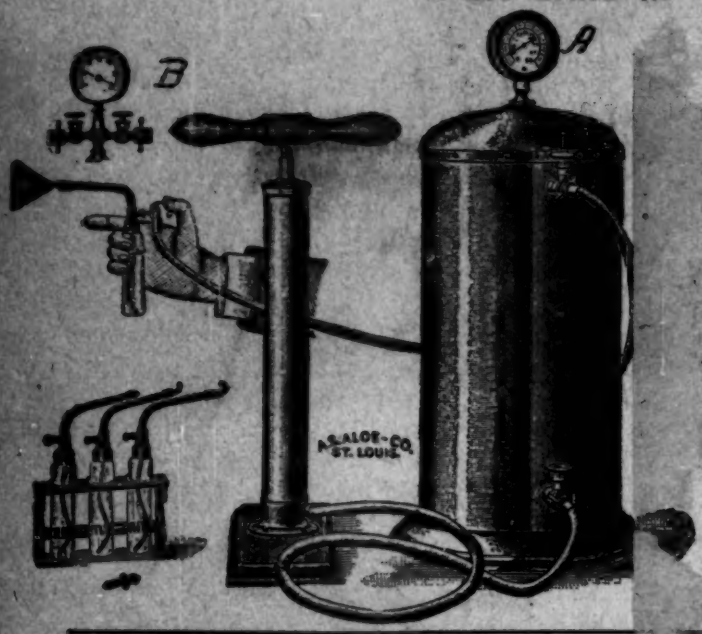

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